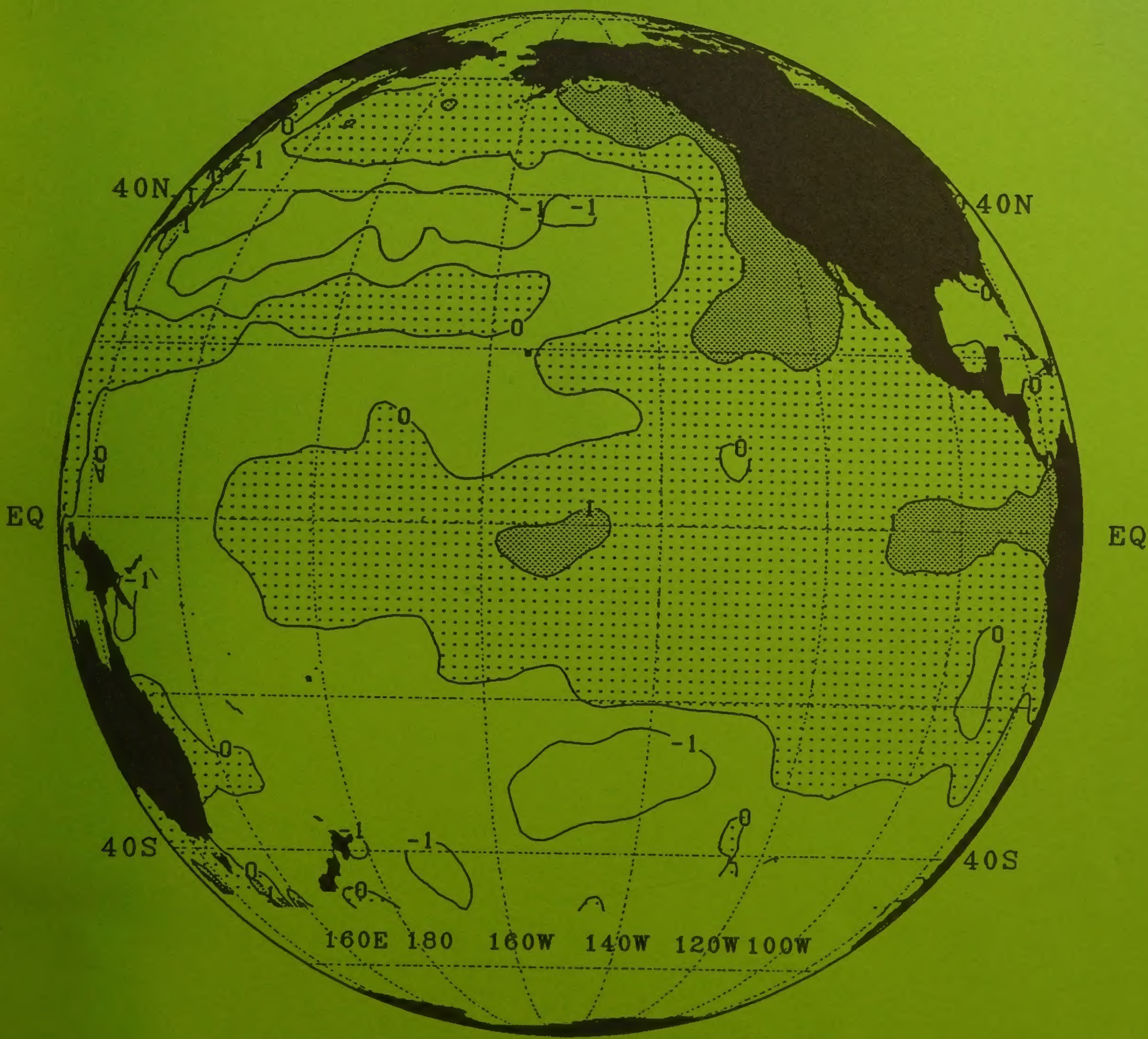
気 象 庁 海 洋 月 報

Monthly Ocean Report

June 1993 (No.6)



El Niño Monitoring Center
Japan Meteorological Agency

気象庁海洋気象部海洋課
エルニーニョ監視センター

平成5年6月

気象庁海洋月報は、気象庁海洋気象部海洋課エルニーニョ監視センターで
作成されています。本月報に関する問い合わせは、
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Monthly Ocean Report is prepared by the El Niño Monitoring Center (ENMOC),
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表紙は1993年6月の太平洋の月平均海面水温偏差図です。
陰影部は平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for June 1993 in the Pacific Ocean. Areas of positive anomalies are shaded.

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海況の特徴（1993年6月）

太平洋の海況

太平洋赤道域の海面水温は、170°E以東で平年より0.5℃以上高い状態が続き、150°W付近と110°W以東では1℃以上平年より高かった。エルニーニョ監視海域(4°S-4°N,150°W-90°W）の海面水温偏差は、+0.9℃で5月より小さくなった。西部では負偏差から平年並になった（第1表、第1図、第6図）。

第9図によれば、赤道域の20℃の深度は、西部及び東部では若干深まる傾向が続いているが、中部では5月と同様の状態が続いている。

気象庁の海洋気象観測船「凌風丸」は本年6月、日本近海から赤道域に至る東経155°Eに沿う海洋観測を行った。その結果、0～7°Nにかけての28℃以上の暖水層の厚さは平年より薄く、エルニーニョ現象が終息に向かっていた昨年と比べても本年の方が薄かった。また、5°N付近を中心とする水温躍層の南北勾配は昨年より強く、東向きの北赤道反流が昨年よりも強いことを示唆している。この状態は全般に1991年に似ている（図 A）。

北太平洋の海面水温は、北米沖で1℃以上の正偏差域が広がり、カリフォルニア半島沖では一部2℃以上高かった。一方、北太平洋では、日本の周辺から135°Wにかけての25～45°Nで平年より低かった(第1図）。

日本近海の海況

日本近海の海面水温は、北海道西方及び南西諸島付近を除き平年より低く、特に釧路沖から三陸沖にかけて及び東海沖では1℃以上低かった（第17図）。

黒潮は、九州・四国・紀伊半島に沿って流れた後、東海沖で大蛇行流路をとり、32°N付近まで南下して141°E線に沿って北上し、房総半島沖を東に流れていた（第20図）。

本州東方の親潮系の冷水（深さ100mで5℃以下）は平年より南下した状態が続き、沿岸寄りの分枝は、38.9°N·142.9°Eまで、沖合の分枝は37.5°N·145.3°Eまでそれぞれ達していた（第19図）。

熱帯の気象

今月も対流活動は日付変更線付近では平年より活発で、西部熱帯太平洋域では平年より不活発だった。平年ではフィリピン付近に存在する200hPaの発散の中心はインドシナ半島付近と、赤道上の150°E付近の2つに分かれた。太平洋赤道域の東西風は上層(200hPa)では平年並だったが、下層（850hPa）では依然西風偏差であった。また、ＳＯＩは-1.6と大きな負の値であった。インドモンスーンに伴うソマリジェットは平年よりやや南偏した（第1表、第12図、第13図）。［気象庁長期予報課提供］

HIGHLIGHTS June 1993

Pacific

Sea surface temperatures (SSTs) in the equatorial Pacific continued to be more than 0.5°C above normal east of 170°E. Equatorial SSTs around 150°W and east of 110°W were more than 1°C above normal. The SST index for region B (refer to Fig.6) was +0.9°C which was smaller than the last month. SSTs in the western equatorial Pacific returned to normal conditions (Table 1 and Figs.1, 6).

The depth of 20°C isotherm along the equator (refer to Fig.9) continued to deepen slightly in the western and eastern Pacific, however no significant change occurred in the central Pacific.

According to the oceanographic observations by R/V Ryofu Maru of the JMA from 30°N to 4°S along the meridian of 155°E, the thickness of surface warm water (warmer than 28°C) from 0° through 7°N was thinner than both normal and the last summer when the 1991/92 El niño event was decaying. The thermocline declined southward sharper than the last summer around 5°N, suggesting that the North Equatorial Countercurrent was stronger there (Fig. A).

In the North Pacific Ocean, SSTs off North America were more than 1°C above normal and SSTs off Baja California were 2°C above normal. Negative SST anomalies prevailed between 25°N and 45°N from around Japan to 135°W (Fig.1).

Seas adjacent to Japan

SSTs were lower than normal in seas adjacent to Japan except west of Hokkaido and around the Nansei Islands. Especially SSTs were more than 1°C below normal from off Kushiro to off Sanriku and off Tokai (Fig.17).

The Kuroshio flowed along the coast of Kyushu, Shikoku and Kii Peninsula, and continued to take the large-meander path off Tokai. It flowed southward to 32°N, northward along 141°E, and eastward off Boso Peninsula (Fig.20).

Coastal and off coastal branches of the Oyashio cold water (colder than 5°C at a depth of 100m) extended southward to 38.9°N, 142.9°E and 37.5°N, 145.3°E, respectively (Fig.19).

Atmospheric conditions in the tropics

The high cloud amounts and their anomalies show that convective activities have been stronger than normal near the date line, while weaker than normal over the western tropical Pacific.

The 200hPa velocity potential map also shows weak convective activities over the Philippines. The upper level (200hPa) westerlies over the equatorial Pacific were almost normal but low level (850hPa) easterlies continued to be weak. The SOI was large negative value (-1.6). The low level jet over the northwestern Indian Ocean shifted southward from the normal position (Table 1 and Fig.12).

[prepared by the Long-range Forecast Division, JMA]

Depth-Latitude Section of Temperature along 155°E

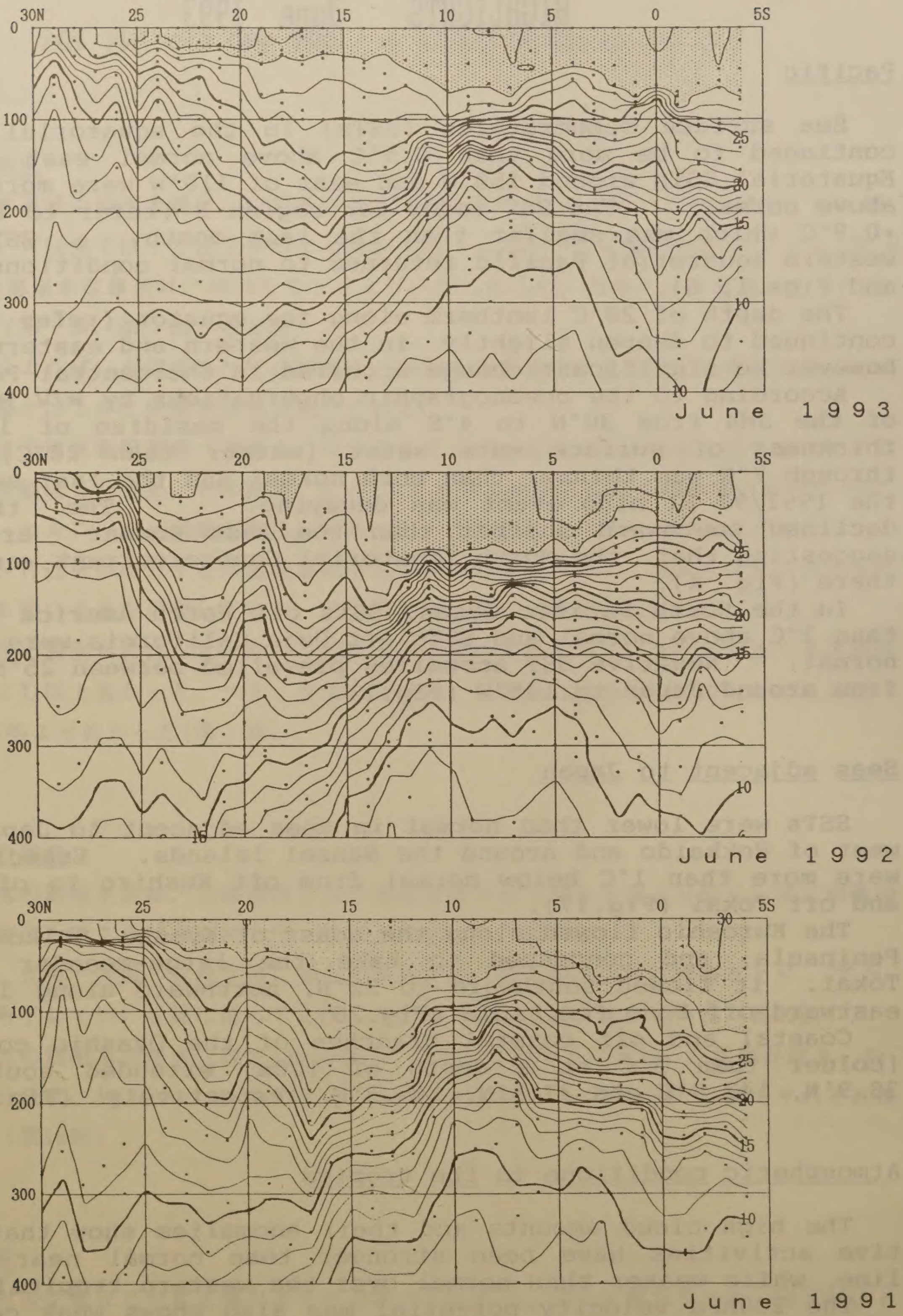


図 A 155°Eに沿う表層水温断面図（上：1993年6月、中：1992年6月、下：1991年6月）

Fig.A Depth-latitude section of ocean temperature along 155°E for June 1993(top), June 1992(middle) and June 1991(bottom). The contour interval is 1℃. Waters warmer than 28℃ are stippled.

Date		1992 JAN	1992 FEB	1992 MAR	1992 APR	1992 MAY	1992 JUN	1992 JUL	1992 AUG	1992 SEP	1992 OCT	1992 NOV	1992 DEC	1993 JAN	1993 FEB	1993 MAR	1993 APR	1993 MAY	1993 JUN
Pacific Sea Surface Temperature (℃)																			
D	(14N~ Eq.) (130E~150E)	28.1	28.0	27.9	28.7	29.1	29.4	29.1	29.1	29.2	29.5	29.0	28.7	28.0	28.0	28.2	28.6	28.8	29.2
		-0.4	-0.3	-0.5	-0.1	0.0	+0.1	-0.1	0.0	0.0	+0.2	-0.2	-0.2	-0.5	-0.3	-0.2	-0.2	-0.3	-0.1
A	(4N~ 4S) (160E~150W)	28.9	29.0	28.9	29.2	29.4	29.2	29.2	29.1	28.8	28.8	28.7	28.8	28.5	28.4	28.4	28.7	29.0	29.1
		+0.9	+1.0	+0.8	+1.0	+0.9	+0.7	+0.7	+0.7	+0.5	+0.4	+0.3	+0.6	+0.5	+0.4	+0.3	+0.5	+0.5	+0.6
B	(4N~ 4S) (150W~ 90W)	26.8	27.6	28.0	28.5	28.3	26.9	25.6	24.6	24.5	24.6	24.7	25.0	25.5	26.6	27.4	28.1	28.0	27.0
		+1.4	+1.4	+1.1	+1.4	+1.7	+0.8	+0.4	0.0	-0.1	0.0	+0.1	+0.1	+0.1	+0.4	+0.5	+1.0	+1.4	+0.9
C	(Eq.~ 10S) (90W~ 80W)	25.1	26.8	27.5	28.0	26.4	23.7	21.6	20.5	20.2	20.8	21.2	22.5	24.3	26.1	27.0	26.4	25.2	23.3
		+0.8	+1.1	+1.6	+2.9	+2.5	+1.0	0.0	-0.1	-0.1	+0.1	-0.3	-0.1	0.0	+0.4	+1.1	+1.3	+1.3	+0.6
Pacific Sea Level Anomaly (cm)																			
YAP	(10N,138E)	-2	-2	2	1	6	5	-2	-3	2	9	6	8	7	9	11	1	-2	
RABAUL	(4S,152E)	-13	-18	-18	-18	-20	-18	-13	-11	-10	-6	-6	-6	-9	-10	-14	-12	-13	
MAJURO	(7N,171E)	-12	-9	-7	0	-2	4	7	7	11	15	6	4	-1	-4	-4	-8	-1	
TARAWA	(1N,173E)	1	-3	-4	-7	-2	-2	2	3	5	2	2	4	1	7	10	3	5	
CHRISTMAS	(2N,157W)	18	15	15	7	5	-3	-2	-7	-4	-3	4	1	5	4	8	6	5	
SANTA CRUZ	(1S, 90W)	18	20	18	8	4	-4	-1	-1	-3	-1	-1	-2	4	8	7	7	10	

第1表 (a) エルニーニョ監視指数

Table 1(a) El Niño monitoring indices. Data sources are the El Niño Monitoring Center, JMA for the sea surface temperature and the SOC of ISLP-PAC, Dept. of Oceanography, University of Hawaii for the sea level anomaly.

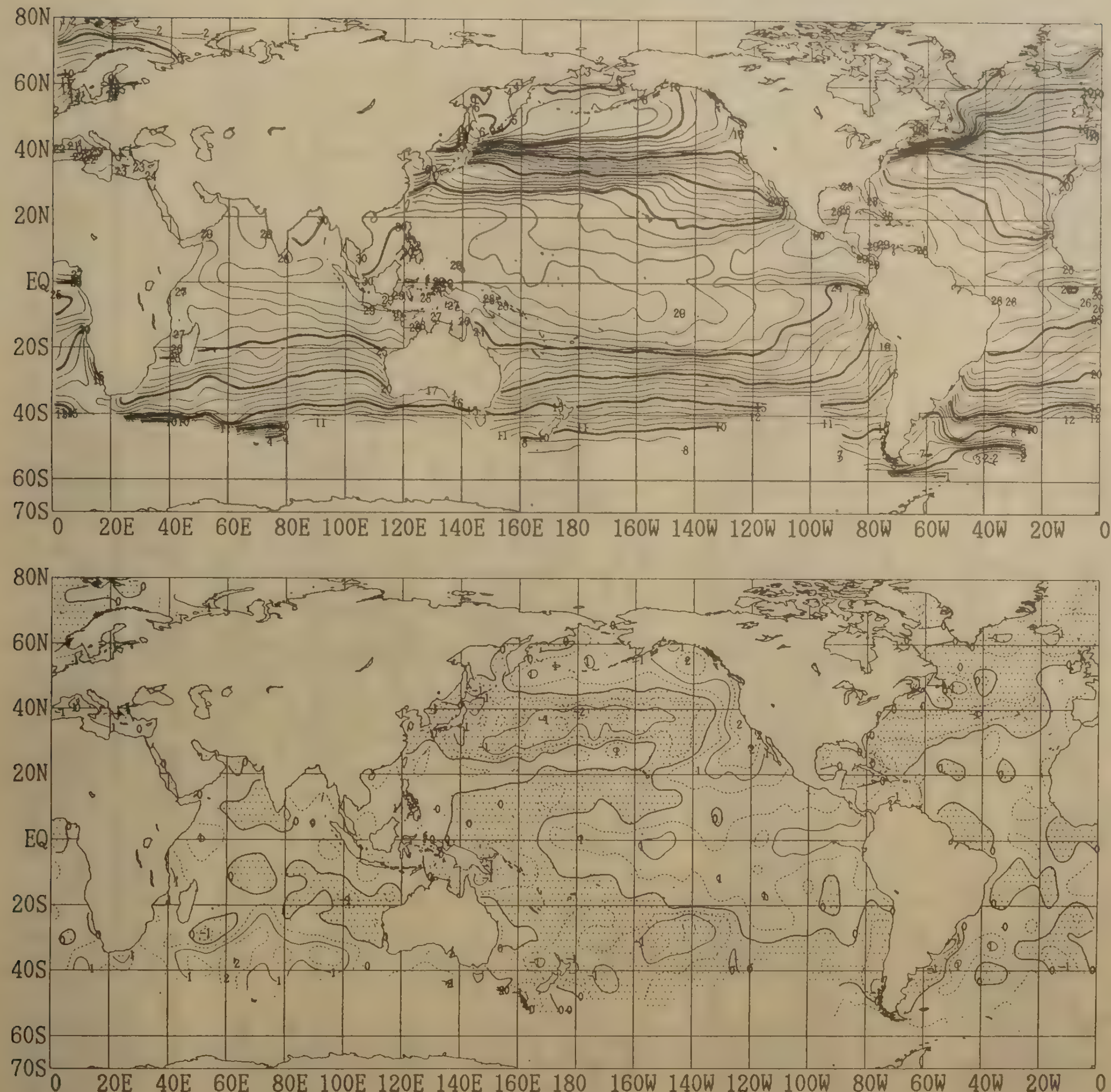
Date	1992											1993					
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Southern Oscillation Index (Unit of pressure anomalies at Tahiti and Darwin : hPa)																		
S O I (TAHITI-DARWIN)	-2.5	-0.8	-2.0	-1.6	-0.1	-1.3	-0.5	0.1	-0.0	-2.0	-0.6	-0.5	-0.8	-0.6	-0.5	-1.9	-0.8	-1.6
TAHITI (17.5S , 150W)	-1.7	-0.9	-1.5	-0.8	0.0	-1.6	0.7	0.1	-0.8	-2.3	-0.5	-1.1	-1.4	-1.9	1.0	-0.7	0.2	-0.6
DARWIN (12.5S , 131E)	3.7	1.0	2.8	1.4	0.1	-0.1	1.6	-0.1	-0.8	0.5	0.6	-0.2	0.4	-0.3	2.4	1.9	1.4	1.3
High Cloud Amount Index																		
HCLD-PH (20N ~ 10N) (110E ~ 140E)	-1.0	-1.2	-1.1	-1.0	-1.5	-1.1	-0.3	0.2	-1.6	0.9	-1.7	-1.4	-1.0	-0.3	-0.4	-0.5	-2.2	-1.9
HCLD-MC (5N ~ 5S) (110E ~ 135E)	-2.2	-1.4	-1.4	-1.0	-1.0	-0.7	-0.5	-1.2	-0.4	0.6	-0.8	0.4	-1.1	-0.9	-1.1	0.3	-1.4	-2.1
HCLD-DL (5N ~ 5S) (170E ~ 170W)	1.6	1.0	1.8	2.3	2.0	1.7	0.0	0.1	-0.6	-0.1	1.3	1.2	0.8	1.4	0.5	2.8	2.0	1.8
Equatorial Zonal Wind Index																		
U200-IN (5N ~ 5S) (80E ~ 100E)	1.2	-1.3	0.5	0.1	0.6	0.2	-0.4	-0.4	-1.1	-1.4	0.1	0.1	-0.1	0.8	-0.9	-0.3	0.5	0.4
U200-CP (5N ~ 5S) (180 ~ 125W)	0.0	-0.8	-0.8	-0.9	-1.1	-0.1	0.0	1.1	-0.4	0.7	-0.2	0.7	-0.3	-0.3	0.0	-0.6	-1.3	-0.0
U850-WP (5N ~ 5S) (160E ~ 175W)	1.8	0.6	1.0	0.9	0.6	0.1	0.1	-0.4	0.2	0.2	0.4	0.8	0.3	0.9	0.3	0.8	0.5	0.3
U850-CP (5N ~ 5S) (170W ~ 135W)	1.8	0.8	1.1	0.8	0.9	0.1	0.3	-0.7	0.5	-0.4	0.9	0.2	0.2	0.0	-0.1	0.3	0.6	0.6
U850-EP (5N ~ 5S) (130W ~ 100W)	1.6	0.0	0.3	0.2	0.5	0.4	-0.1	-0.9	0.6	-1.2	1.9	-0.0	0.1	-0.1	0.2	0.5	0.9	0.7

第1表 (b) エルニーニョ監視指数(続き)

Table 1(b) El Niño monitoring indices (continued) .

Data source for these atmospheric conditions is the Long-range Forecast Division, JMA.

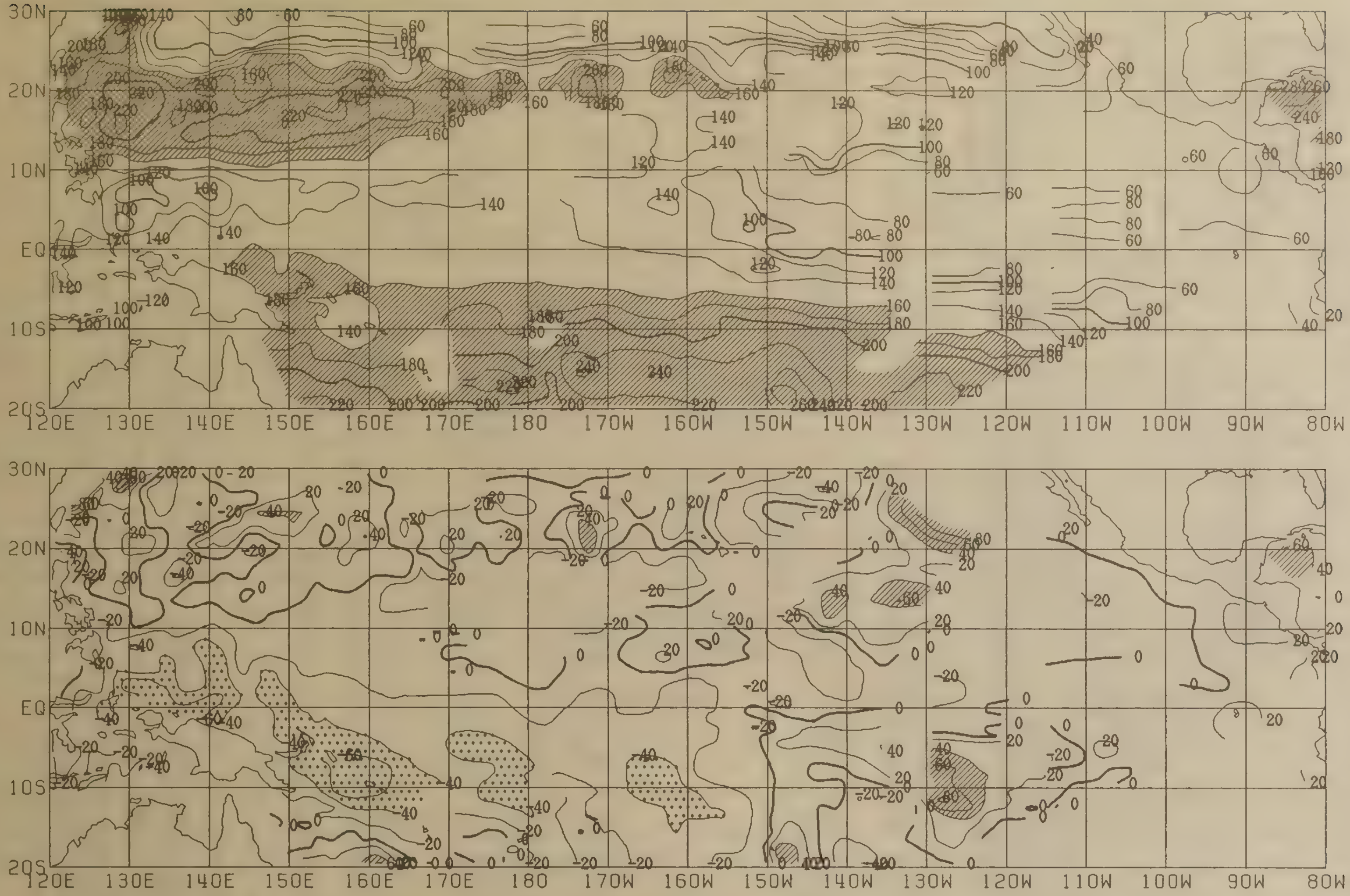
SST & Anomalies in the Global Ocean



第１図　全球月平均海面水温図（上）及び偏差図（下）（1993年 6月）

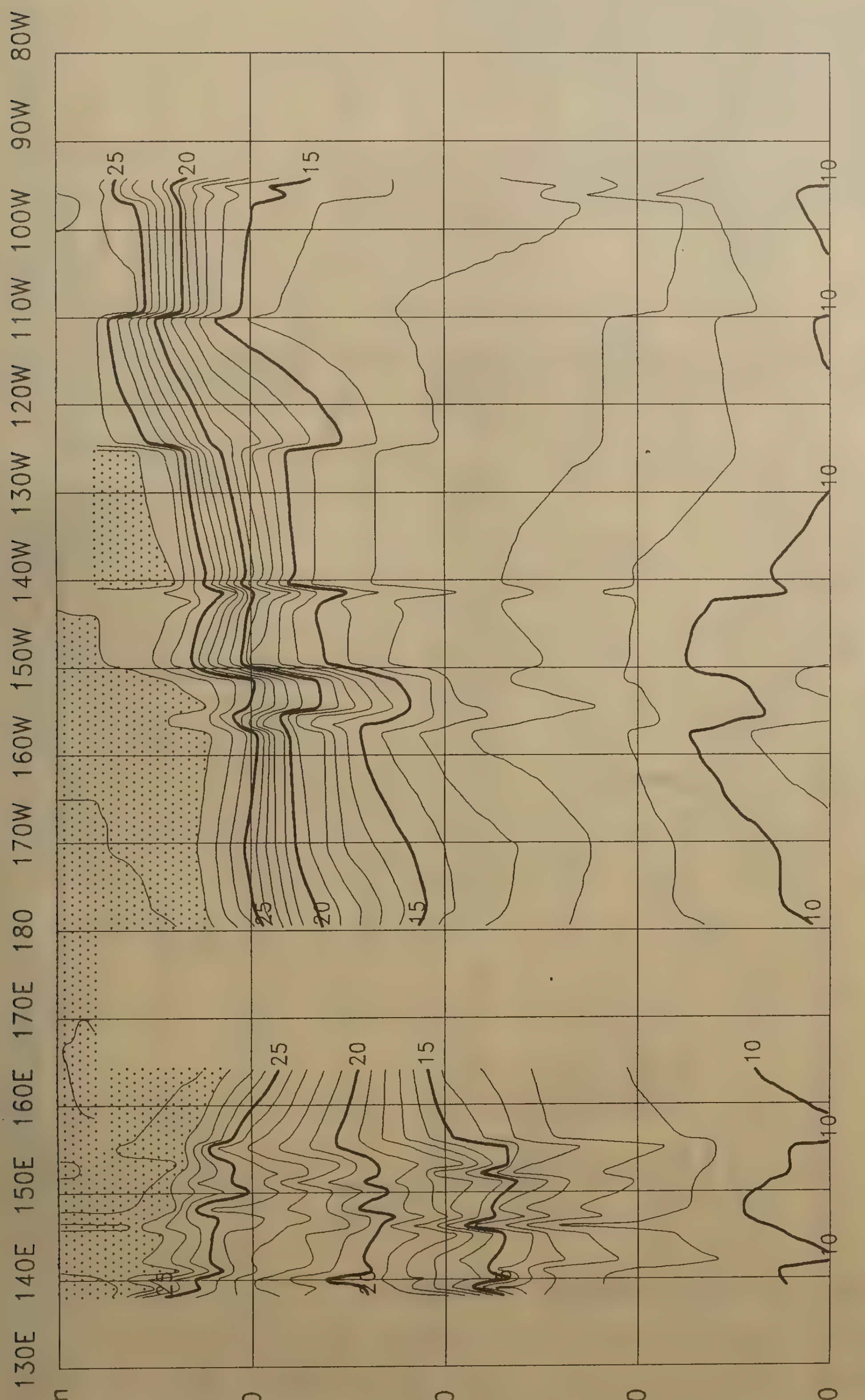
Fig.1 . Monthly mean sea surface temperature in the global ocean (top) and anomalies (bottom) for JUN 1993. Anomalies are computed with respect to the JMA climatology (1961–90) (Climatic charts of sea surface temperatures of the western North Pacific and the global ocean , March 1991). The Contour interval is 1° C and additional anomaly contours of ±0.5° C are shown as broken lines. Negative anomalies are stippled.

Depth of 20° C & Anomalies in the Pacific Ocean



第２図　太平洋表層水温（20℃深度）図（上）及び偏差図（下）（1993年 6月）

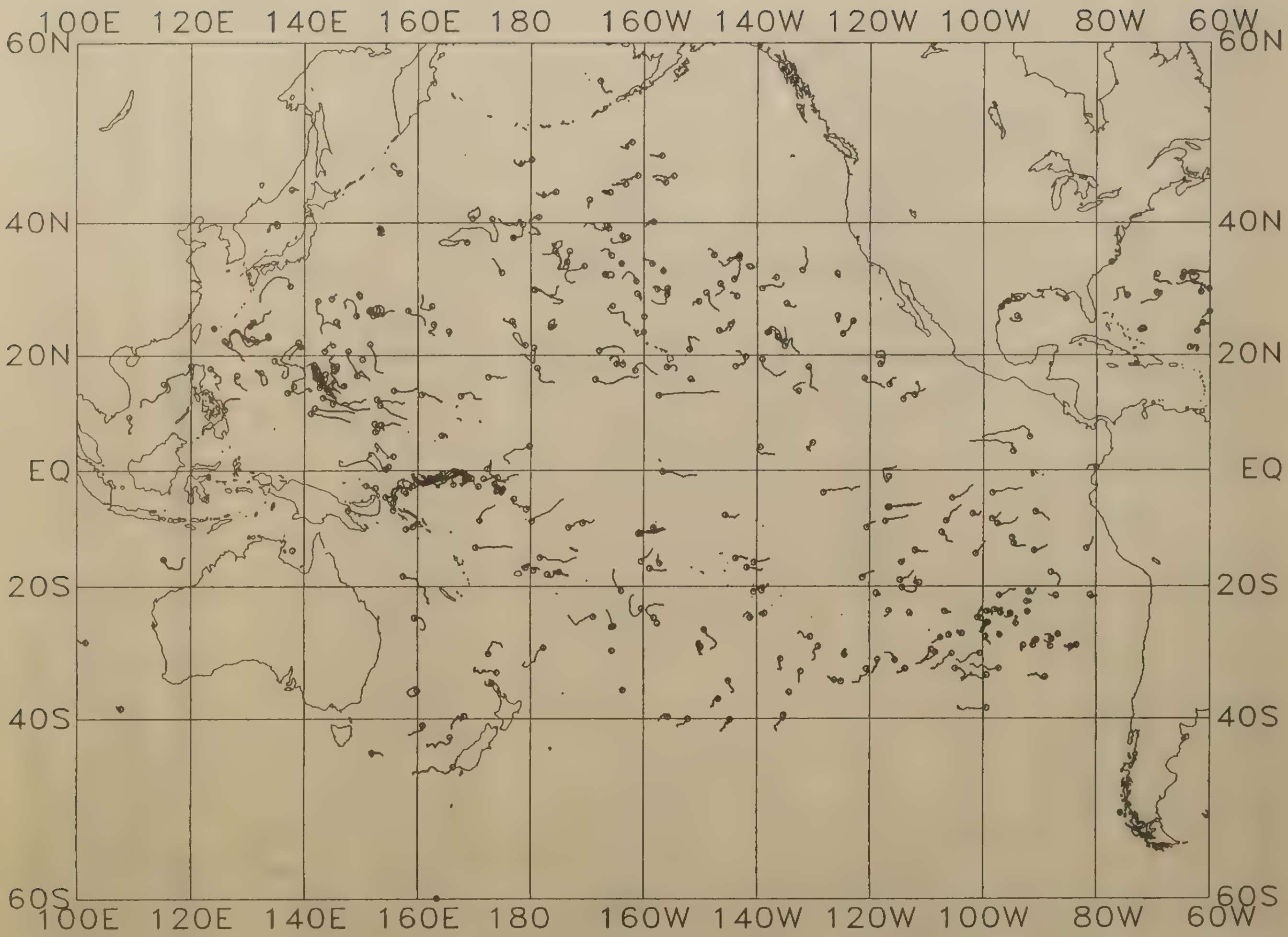
Fig.2 The depth of a 20° C isotherm in the Pacific Ocean (top) and anomalies (bottom) for JUN 1993. Anomalies are computed with respect to the climatology (Levitus, 1982, Climatological Atlas of the World Ocean, NOAA).
The contour interval is 20m with shading for values greater than 160m (top), and shading/stippling for values greater/smaller than +40m/−40m (bottom).



第３図　太平洋赤道に沿う表層水温断面図（1993年 6月）

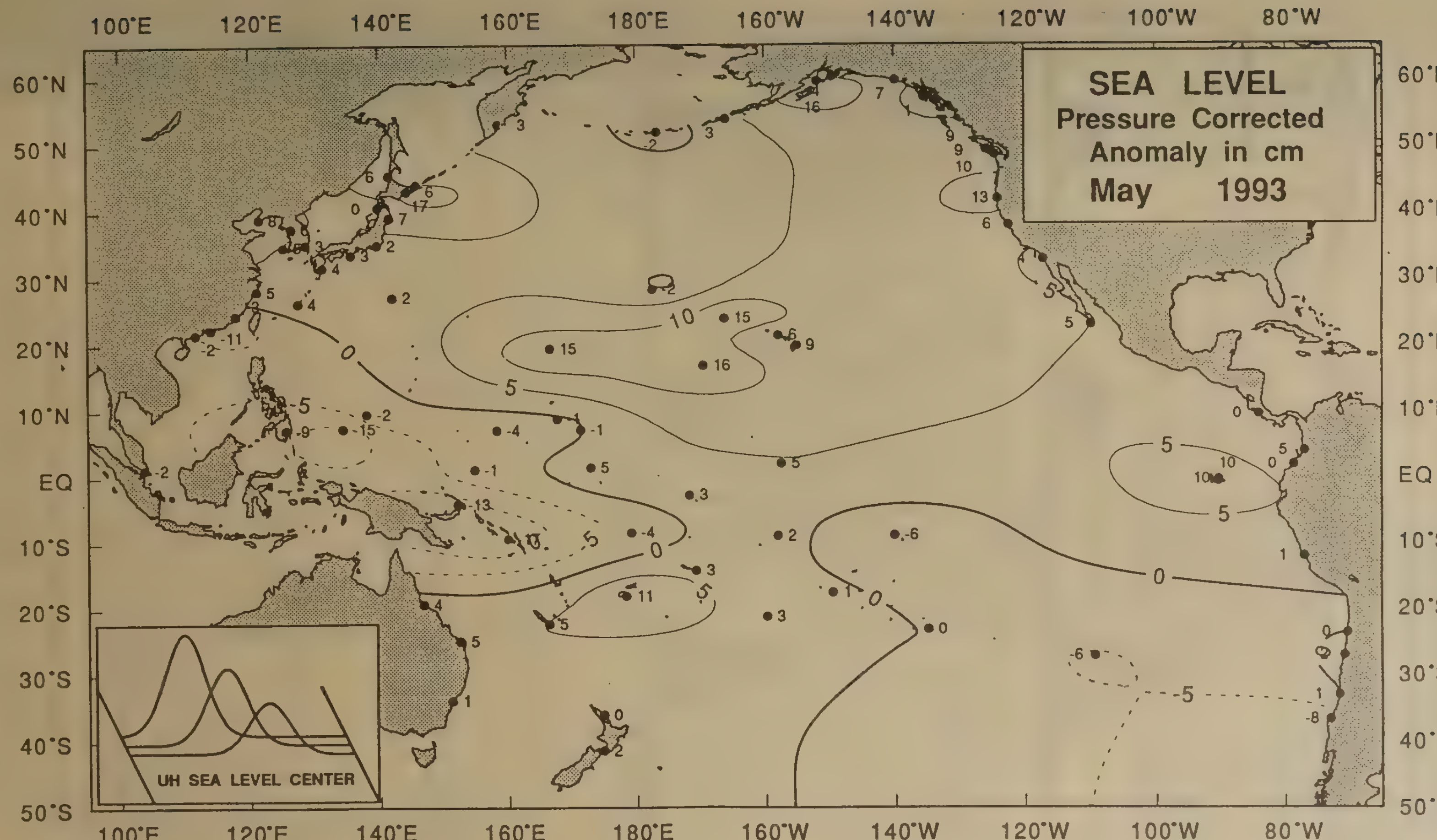
Fig.3 Depth–longitude section of the Pacific Ocean temperature along the equator for JUN 1993. The contour interval is 1° C with spotted shading for values greater than 28° C.

Movements of Drifting Buoys



第4図　太平洋ブイ流跡図(1993年 6月)

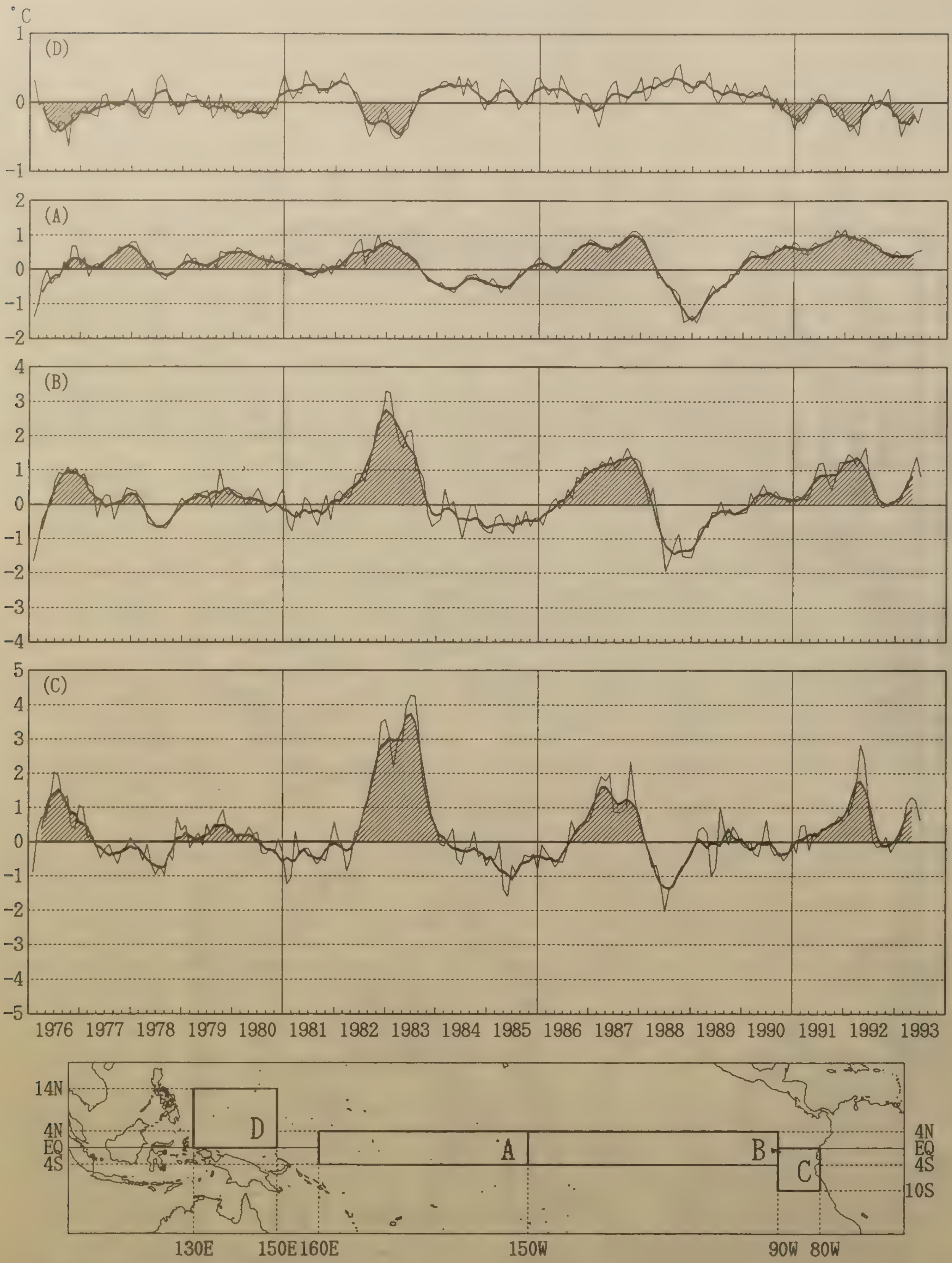
Fig.4 Movements of drifting buoys in the Pacific Ocean during JUN 1993. Each track is one buoy, with the small circle representing the buoy's last position for the month.



第5図　太平洋海面水位偏差図（ 1993年 5月 ）

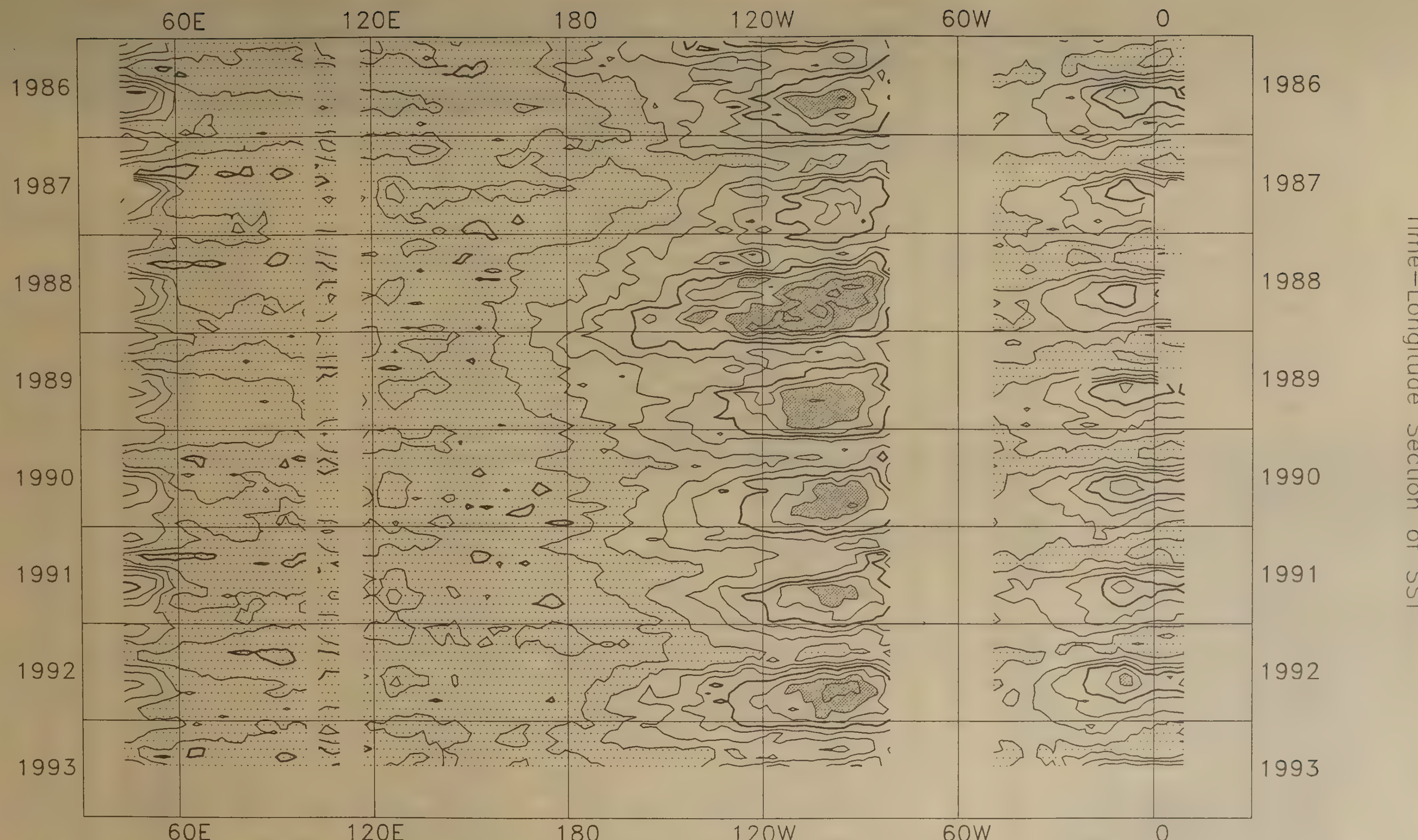
Fig.5　Sea level anomalies obtained from the 1975 to 1986 mean MAY sea level adjusted for atmospheric pressure (MAY 1993).
This figure is prepared by the SOC of ISLP−PAC, Dept. of Oceanography, Univ. of Hawaii.

Time Series of Equatorial Pacific SST Anomalies



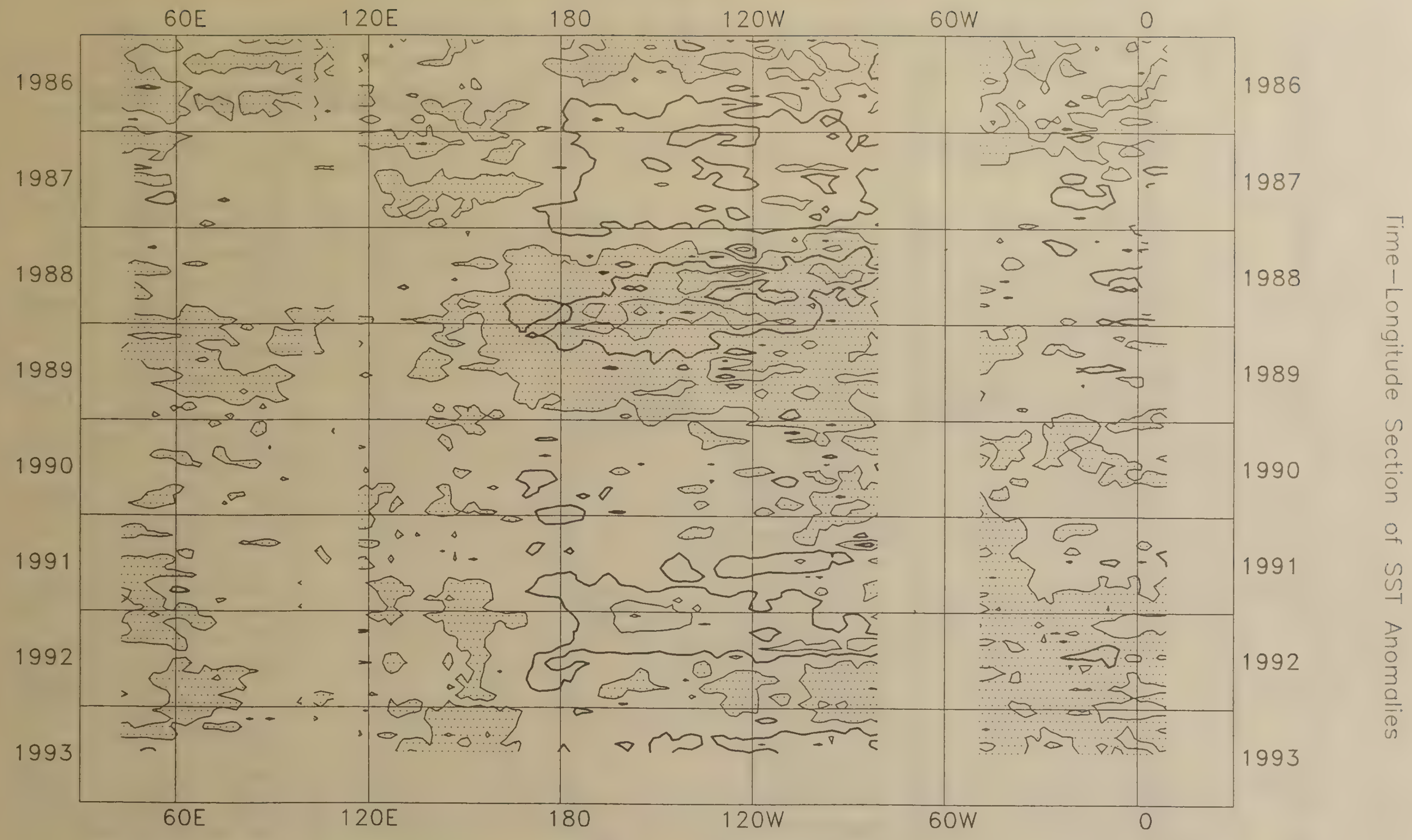
第６図　赤道太平洋海面水温偏差時系列図

Fig.6 Time series of monthly mean SST anomalies in the equotorial Pacific Ocean for the areas indicated at the bottom of the figure. Thin lines show the monthly values and thick lines their 5 month running mean. Positve anomalies (A,B,C) and negative anomalies (D) are shaded. Anomalies are computed with respect to the JMA climatology (1961–90).



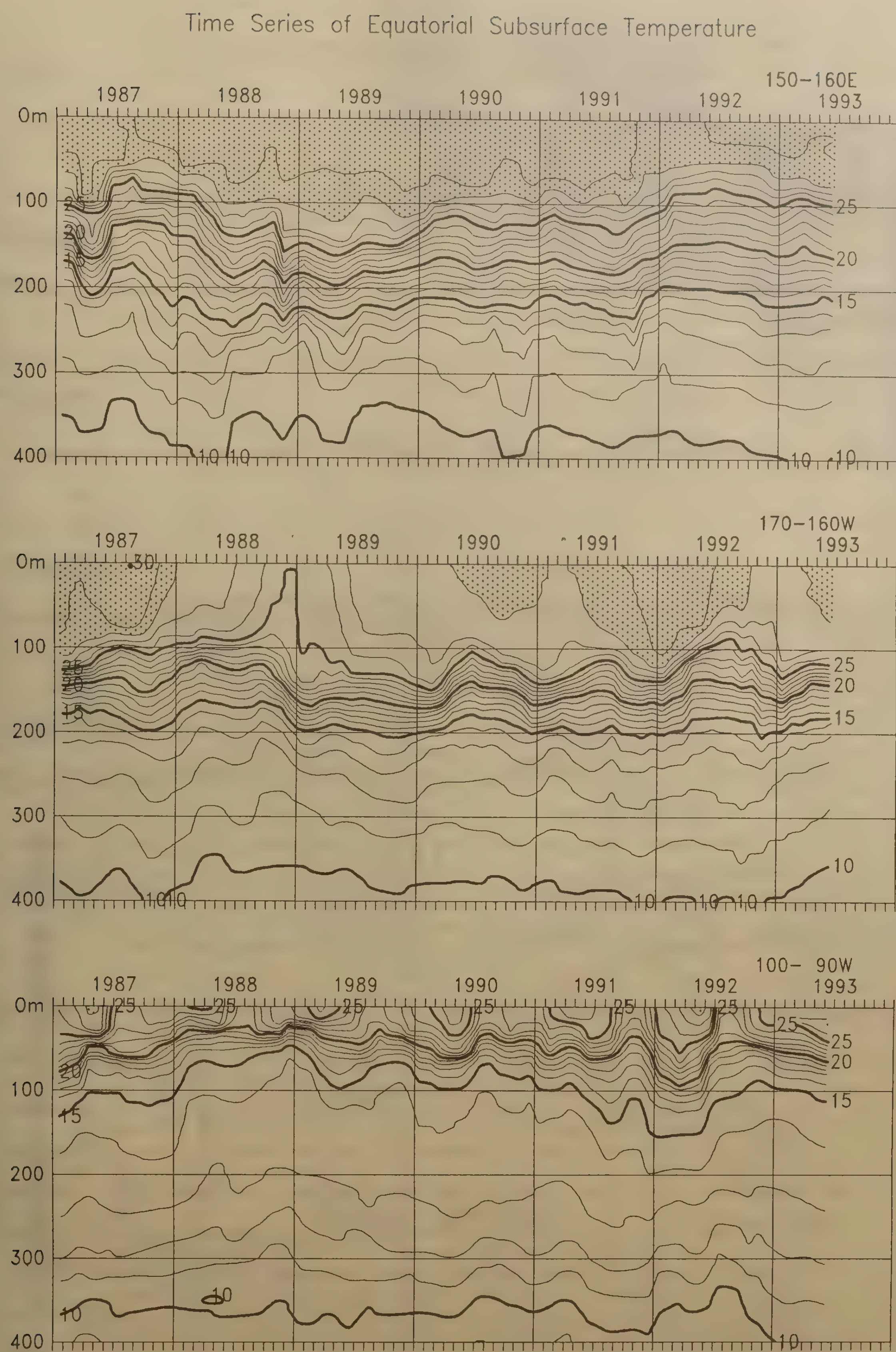
第7図　赤道に沿う海面水温時系列図

Fig.7 Time-longitude section of SSTs along the equator (2° N-2° S) in the global ocean. The contour interval is 1° C, with thick contour lines at 25 and 30° C. SST values greater than 28° C are spotted and values less than 23° C are shaded.



第8図　赤道に沿う海面水温偏差時系列図

Fig.8 Time-longitude section of SST anomalies along the equator (2° N-2° S) based on the JMA climatology (1961-1990). The contour interval is 1° C, with thick contour lines at +1° C and -1° C. Negative anomalies are spotted.



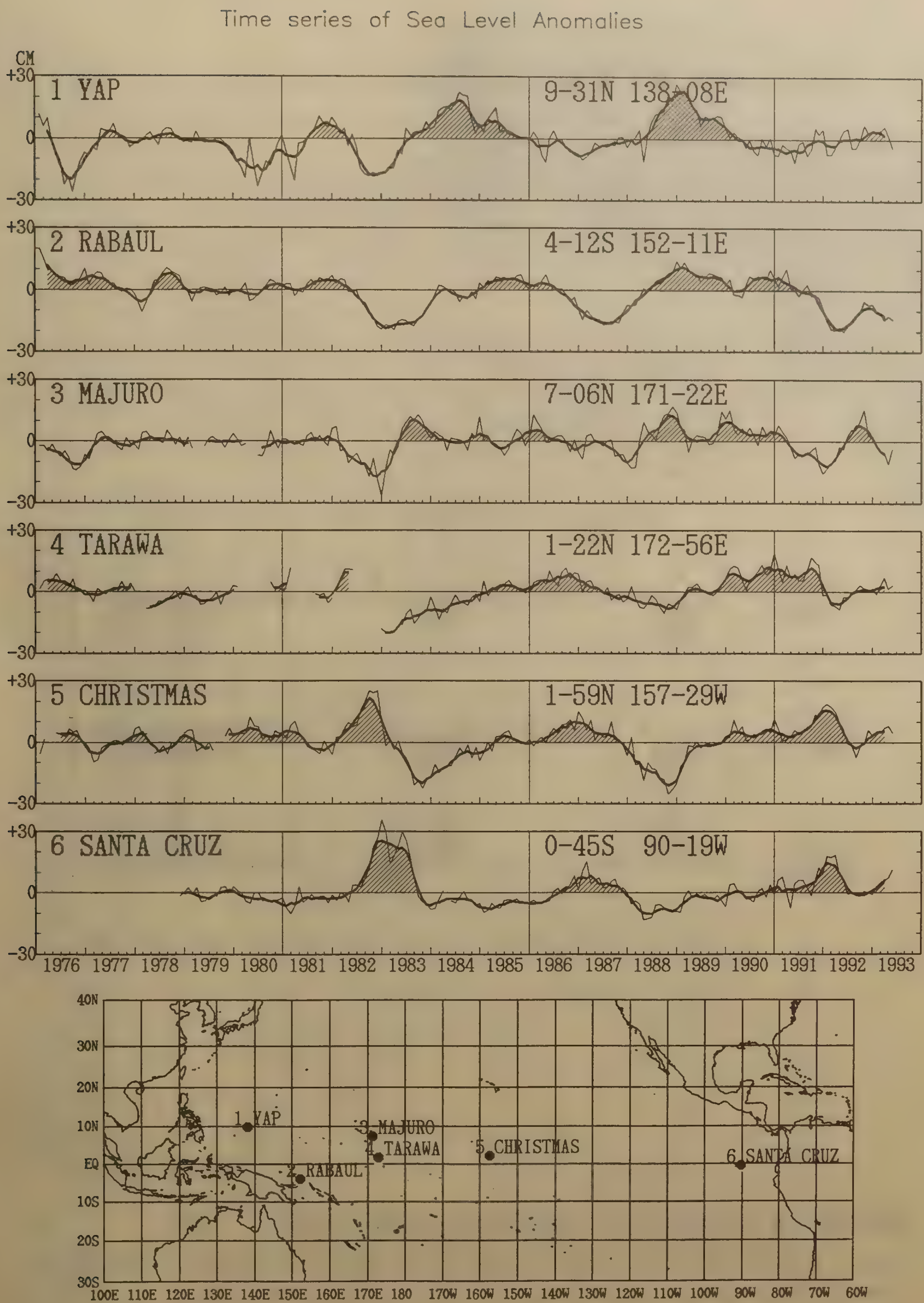
第９図　赤道太平洋表層水温時系列図（上：西部、中：中部、下：東部）

Fig.9 Time series of equatorial (2° N-2° S) subsurface temperature for the western Pacific (top, 150-160° E), the central Pacific (middle, 170-160° W) and the eastern Pacific (bottom, 100-90° W). The contour interval is 1° C with spotted shading for the values greater than 28° C.



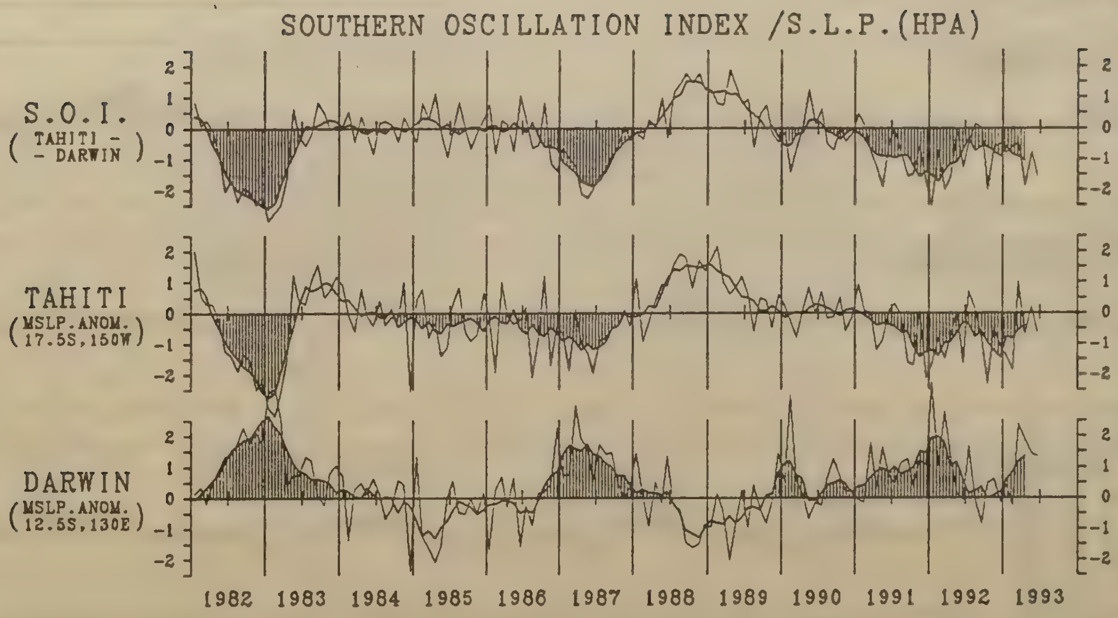
第10図　太平洋の赤道に沿う20℃深度時系列図

Fig.10 Time-longitude section of the depth of a 20° C isotherm along the equator in the Pacific Ocean. The contour interval is 20m with thick contour lines at 100m. Values shallower than 60m are shaded and those deeper than 140m are stippled.



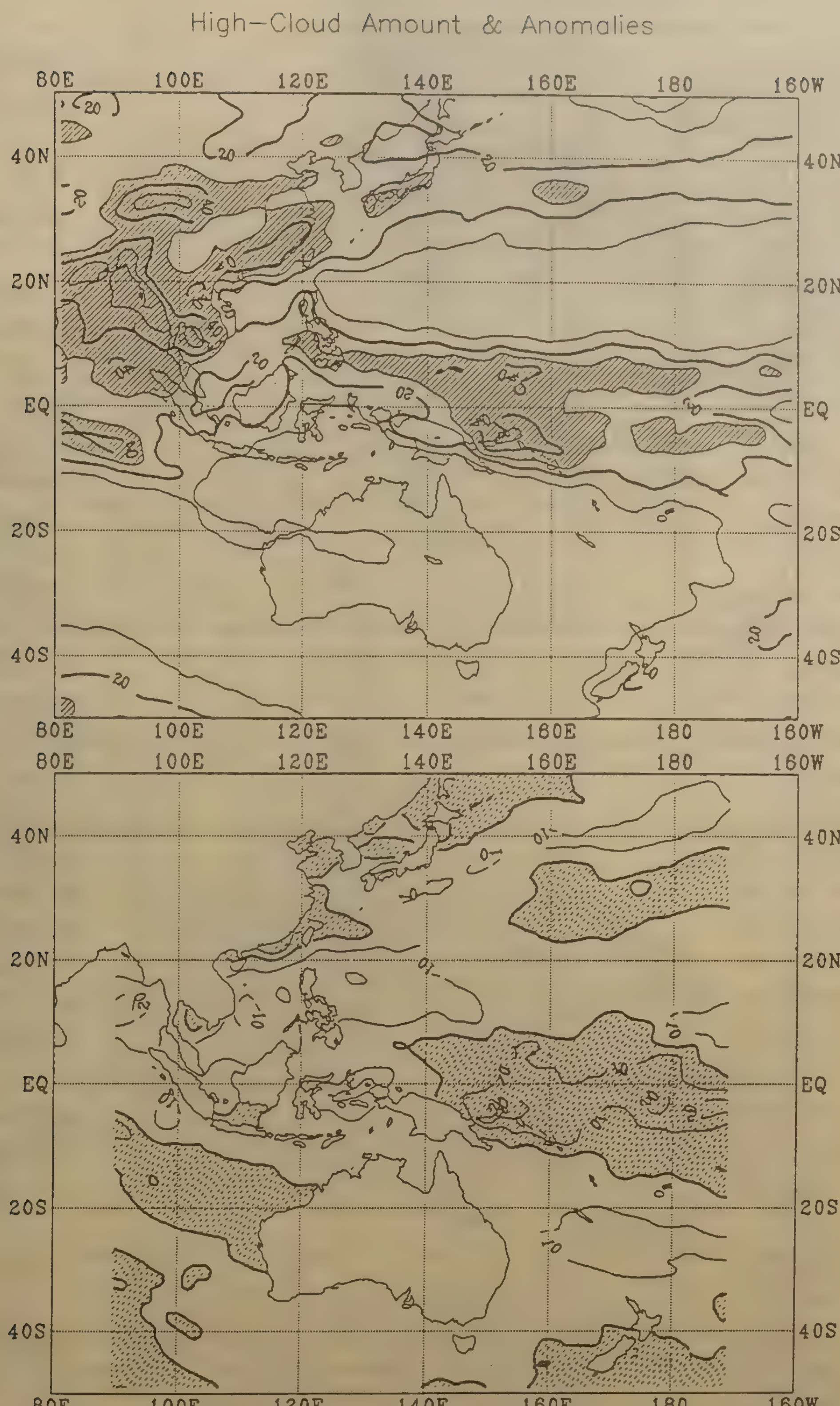
第11図　太平洋月平均海面水位偏差時系列図

Fig.11 Time series of sea level anomalies based on 1976 to 1990 monthly mean sea level obtained from the stations indicated at the bottom of the figure. Thin lines show the monthly mean and thick lines show their 5 month running mean. Positive anomalies are shaded.



第12図　南方振動指数及び海面気圧偏差時系列図

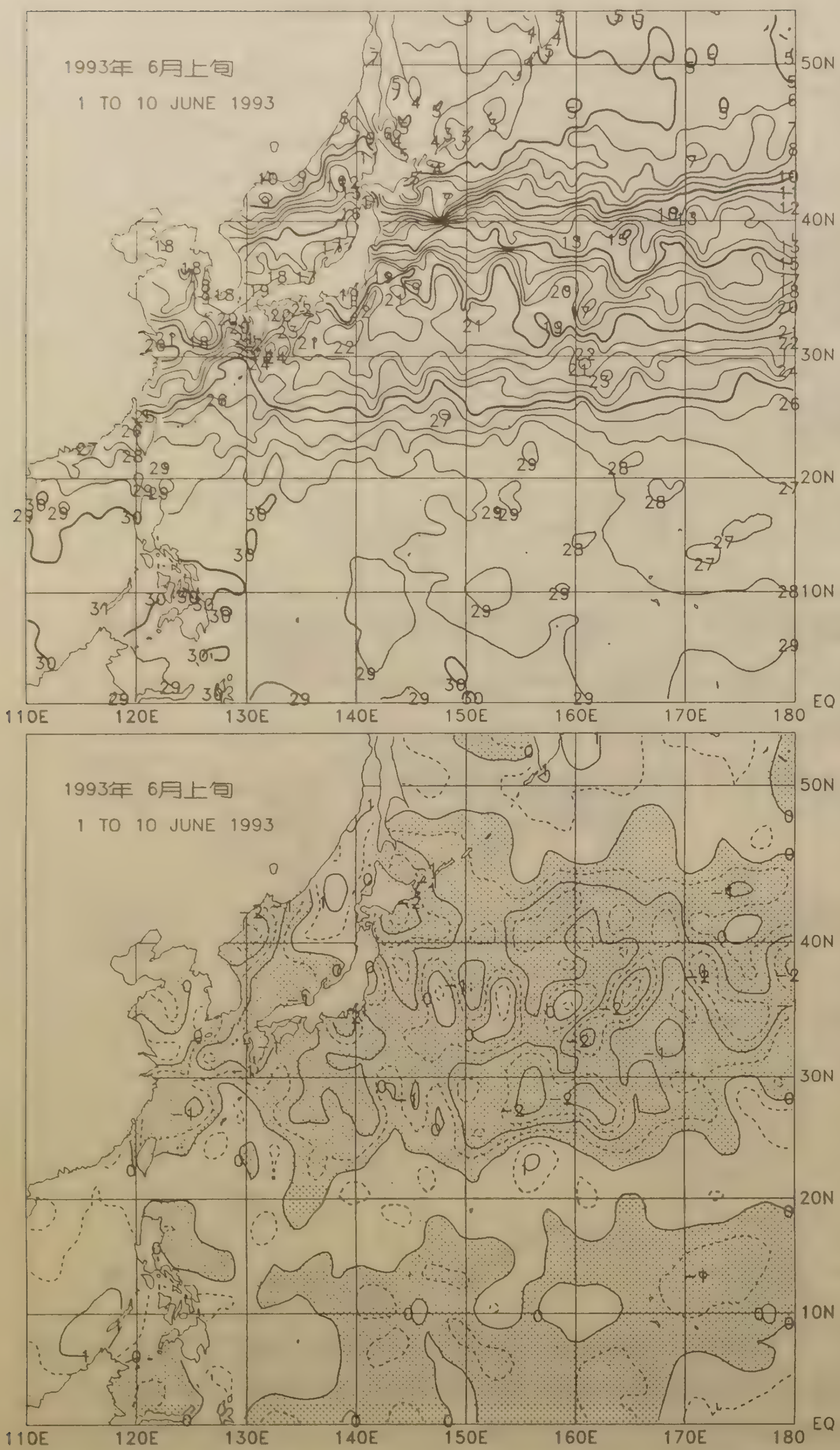
Fig.12 The Southern Oscillation Index (top) and monthly mean sea level pressure standardized anomalies at Tahiti (middle) and Darwin (bottom). Thin lines show the monthly mean and thick lines their 5 month running mean. Negative values (top, middle) and positive values (bottom) are shaded. Base periods for normals and standard deviations are 1961−1990. This figure is prepared by the Long−range Forecast Division, JMA.



第13図　月平均上層雲量分布図及び偏差図（1993年 6月）

Fig.13 Monthly mean of the high-cloud amount (%, top) and its anomalies (%, bottom) in the equatorial Pacific for JUN 1993. The contour interval is 10%. Areas above 30% are shaded (top) and positive anomalies are stippled (bottom). Anomalies represent a departure from the 1978-1990 base period monthly means. This figure is prepared by the Long-range Forecast Division, JMA.

Ten-day mean SST & Anomalies



旬平均沿岸水温(℃)
Coastal Water Temperature

地 名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	26.5	-0.4
那　覇(47936)	25.5	+0.6
名　瀬(47909)	25.4	-
足摺岬(47898)	21.4	-0.4
潮　岬(47778)	21.8	-
御前崎(47655)	19.5	-1.3
八丈島(47678)	19.1	-3.0
館　山(47672)	19.2	-0.1
小名浜(47598)	14.6	+0.2
宮　古(47585)	11.8	+0.4
浦　河(47426)	7.1	-1.6
紋　別(47435)	10.0	-
稚　内(47401)	10.4	-
寿　都(47421)	11.5	-
江　差(47428)	12.8	-
飛　島(47587)	16.1	-0.8
輪　島(47600)	18.6	-0.6
西　郷(47740)	18.1	-
浜　田(47755)	19.4	-
厳　原(47800)	18.3	-
牛　深(47838)	20.0	-

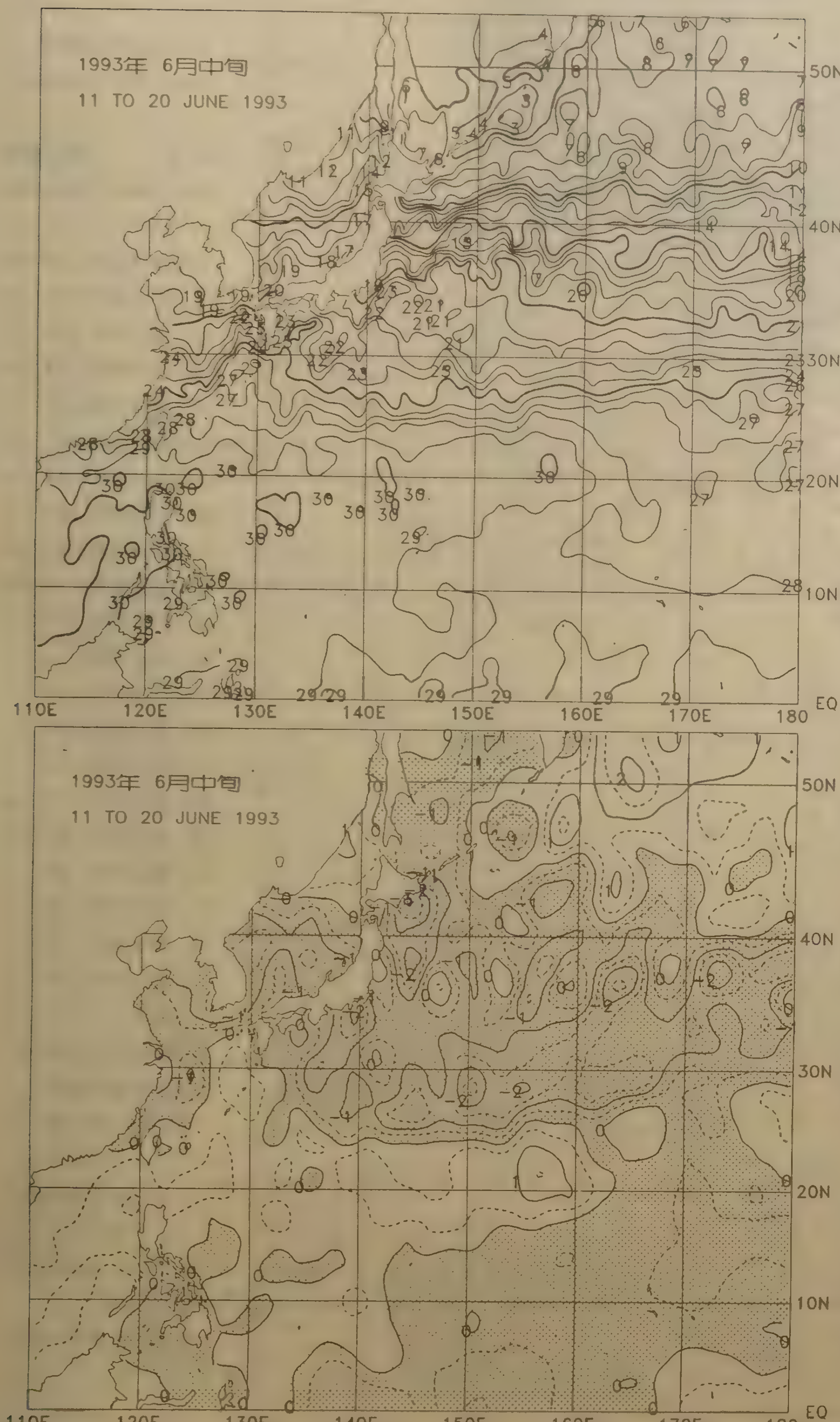
海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	15.8
四国沖	29.0N,135.0E	22.8
東シナ海	28.2N,126.3E	24.5

第14図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 6月上旬)

Fig.14 Ten-day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 1st ten-day period in JUN 1993. Anomalies are computed with respect to the JMA climatology (1961-90). The contour interval is 1°C and additional anomaly contours of 0.5°C are shown. Negative anomalies are stippled.

Ten-day mean SST & Anomalies



旬平均沿岸水温(℃)
Coastal Water Temperature

地 名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	28.3	+0.6
那 覇(47936)	26.9	+1.5
名 瀬(47909)	26.7	-
足摺岬(47898)	21.9	-0.6
潮 岬(47778)	22.4	-
御前崎(47655)	20.9	-0.5
八丈島(47678)	19.5	-3.3
館 山(47672)	19.0	-0.9
小名浜(47598)	15.5	+1.0
宮 古(47585)	12.1	-0.3
浦 河(47426)	9.2	-0.5
紋 別(47435)	11.4	-
稚 内(47401)	-	-
寿 都(47421)	13.4	-
江 差(47428)	15.1	-
飛 島(47587)	17.6	-0.9
輪 島(47600)	20.4	+0.2
西 郷(47740)	19.1	-
浜 田(47755)	21.4	-
厳 原(47800)	19.3	-
牛 深(47838)	21.1	-

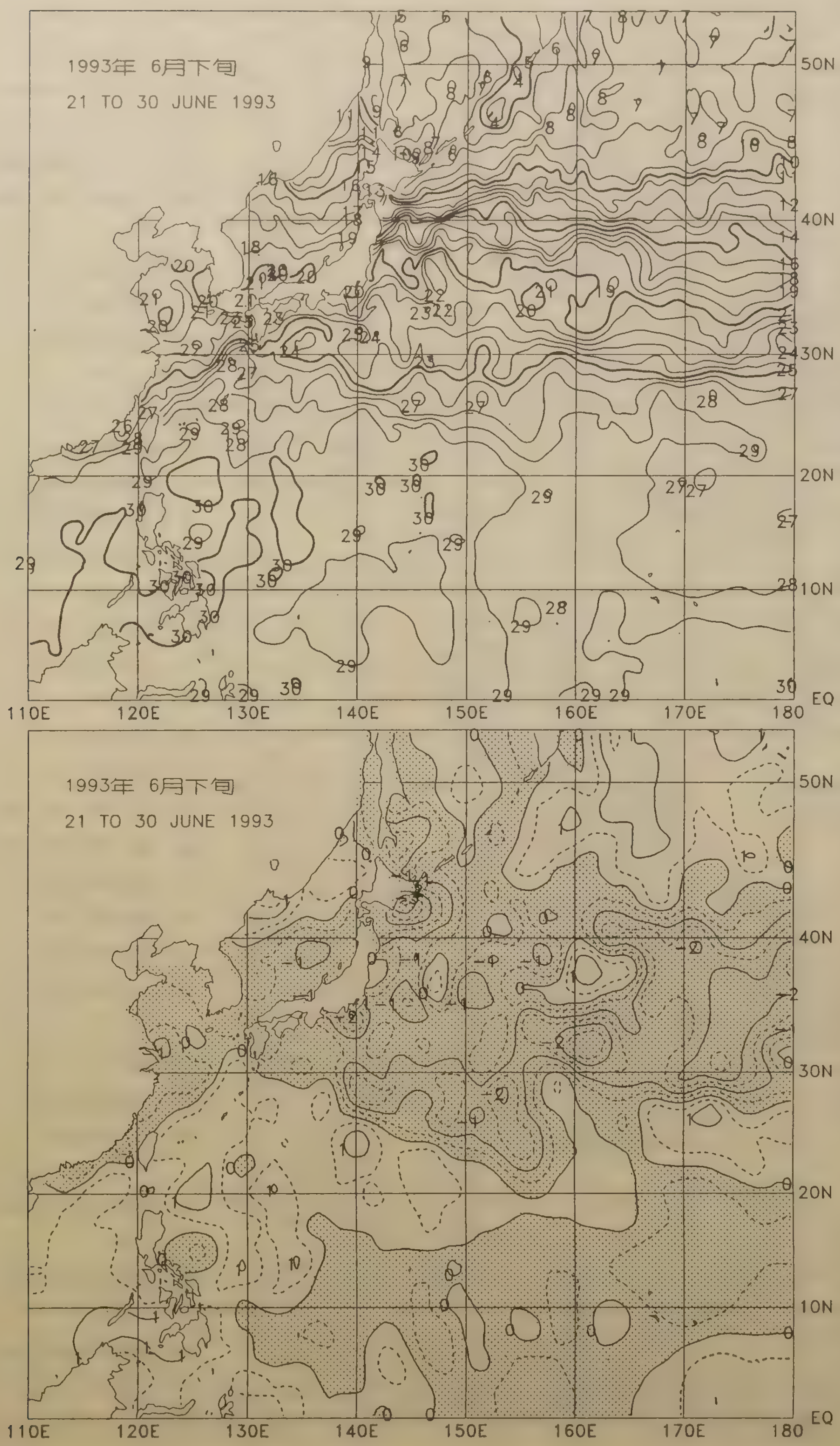
海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	16.7
四国沖	29.0N,135.0E	24.2
東シナ海	28.2N,126.3E	25.5

第15図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 6月中旬)

Fig.15 Ten-day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 2nd ten-day period in JUN 1993. Anomalies are computed with respect to the JMA climatology (1961-90). The contour interval is 1°C and additional anomaly contours of 0.5°C are shown. Negative anomalies are stippled.

Ten–day mean SST & Anomalies



旬平均沿岸水温(℃)
Coastal Water Temperature

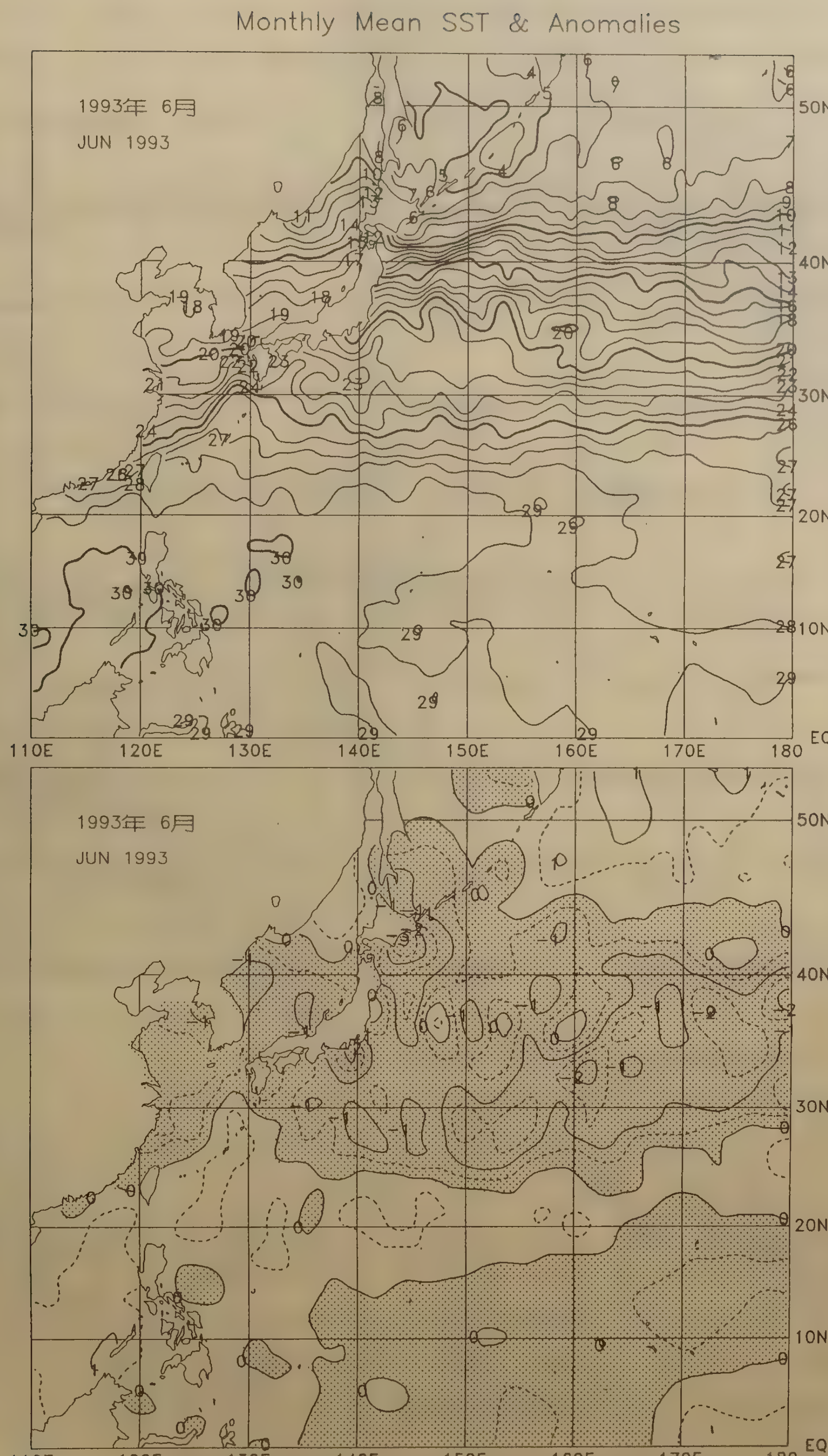
地 名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	29.0	+0.5
那　覇(47936)	27.4	+0.9
名　瀬(47909)	27.8	-
足摺岬(47898)	22.4	−0.7
潮　岬(47778)	22.7	-
御前崎(47655)	21.1	−0.8
八丈島(47678)	18.8	−4.7
館　山(47672)	19.2	−1.4
小名浜(47598)	16.2	+0.6
宮　古(47585)	13.7	+0.2
浦　河(47426)	10.1	−1.3
紋　別(47435)	-	-
稚　内(47401)	12.8	-
寿　都(47421)	14.5	-
江　差(47428)	15.7	-
飛　島(47587)	19.2	−0.8
輪　島(47600)	20.2	−0.8
西　郷(47740)	20.1	-
浜　田(47755)	21.6	-
厳　原(47800)	19.8	-
牛　深(47838)	21.5	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	18.2
四国沖	29.0N,135.0E	26.1
東シナ海	28.2N,126.3E	26.8

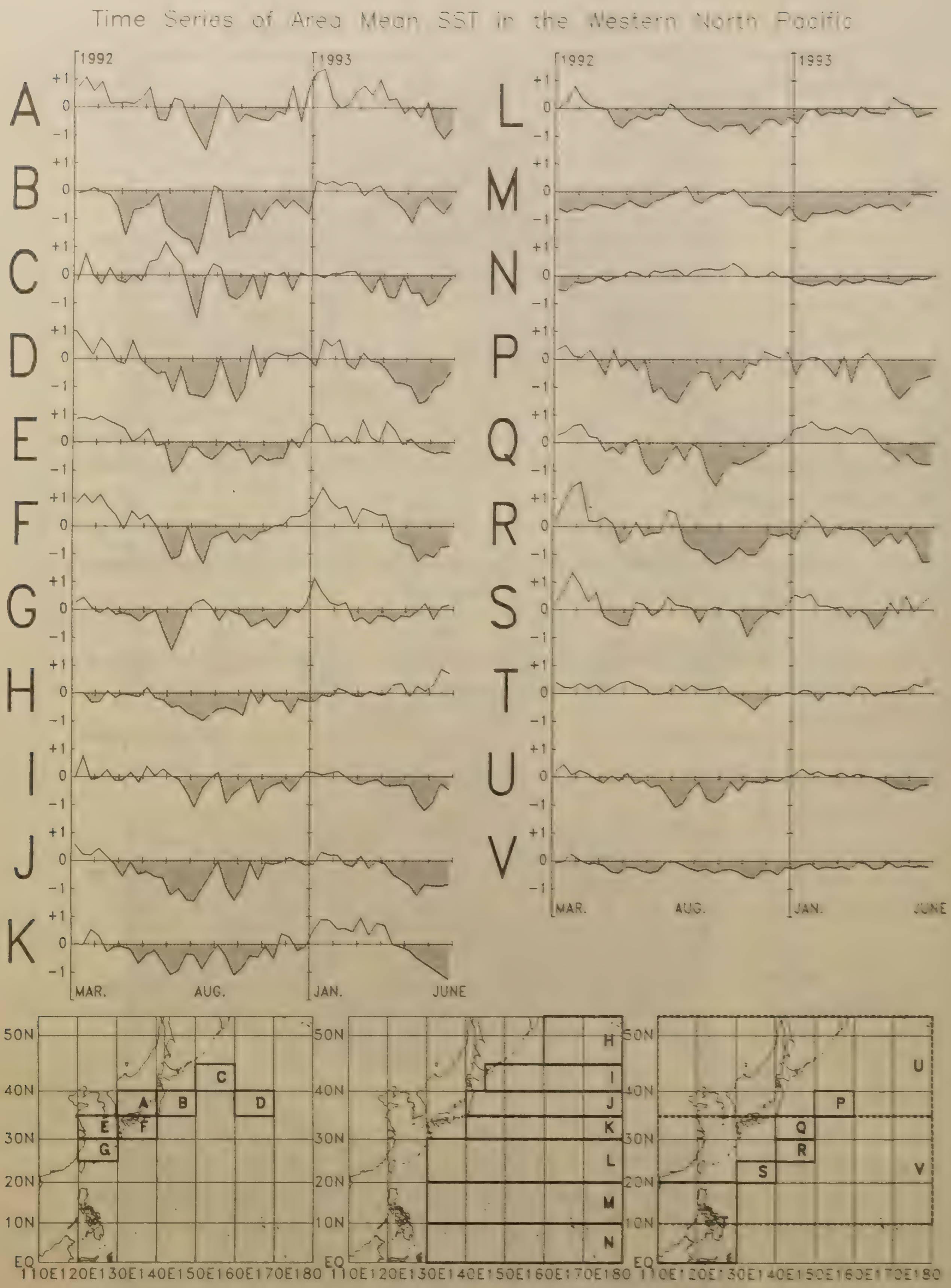
第16図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 6月下旬)

Fig.16 Ten–day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 3rd ten–day period in JUN 1993. Anomalies are computed with respect to the JMA climatology (1961–90). The contour interval is 1°C and additional anomaly contours of 0.5°C are shown. Negative anomalies are stippled.



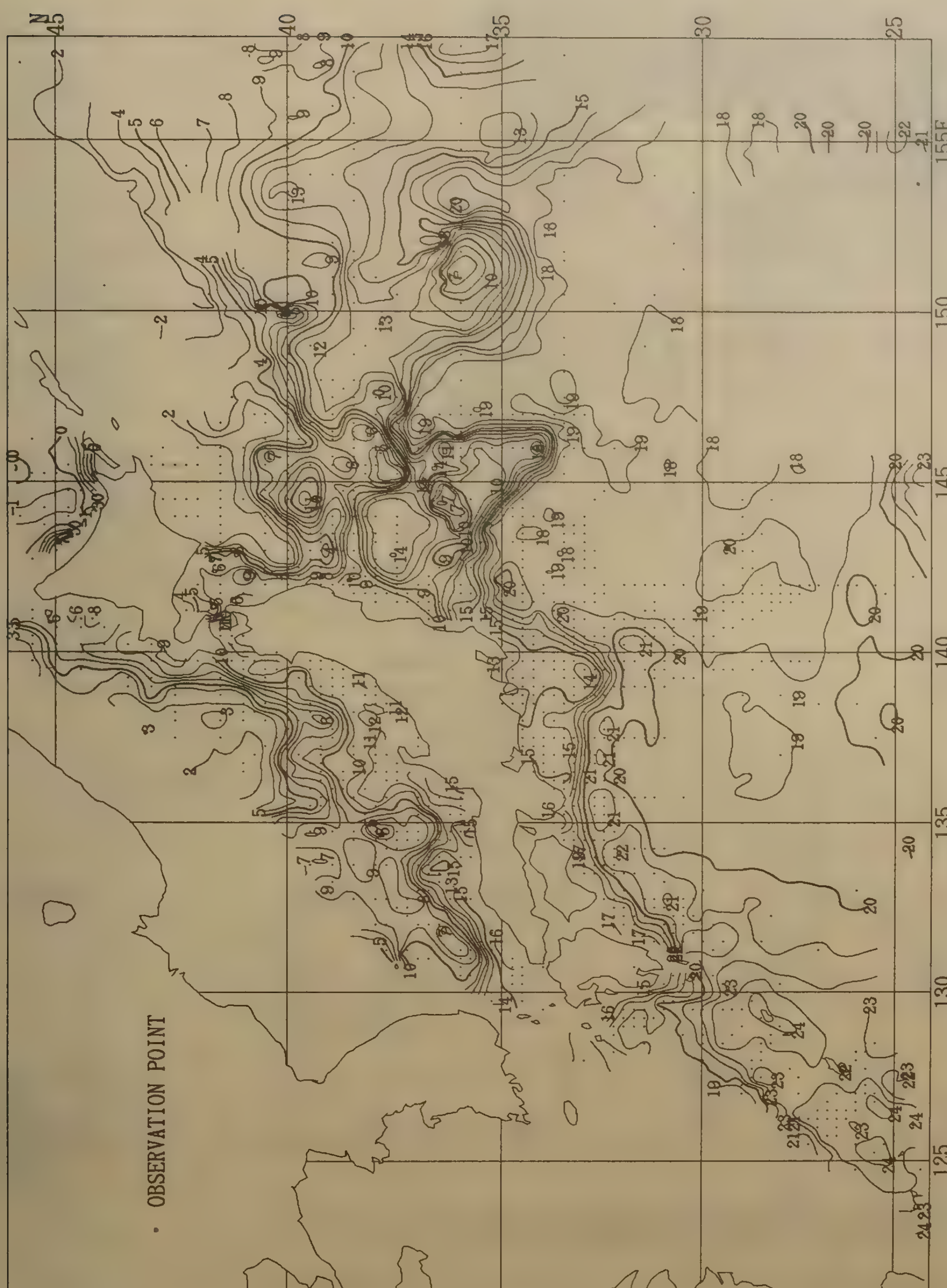
第17図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1993年 6月)

Fig.17 Monthly mean SSTs in the western North Pacific (top) and anomalies (bottom) for JUN 1993. Anomalies are computed with respect to the JMA climatology (1961–90). The contour interval is 1° C and additional anomaly contours of 0.5° C are shown. Negative anomalies are stippled.



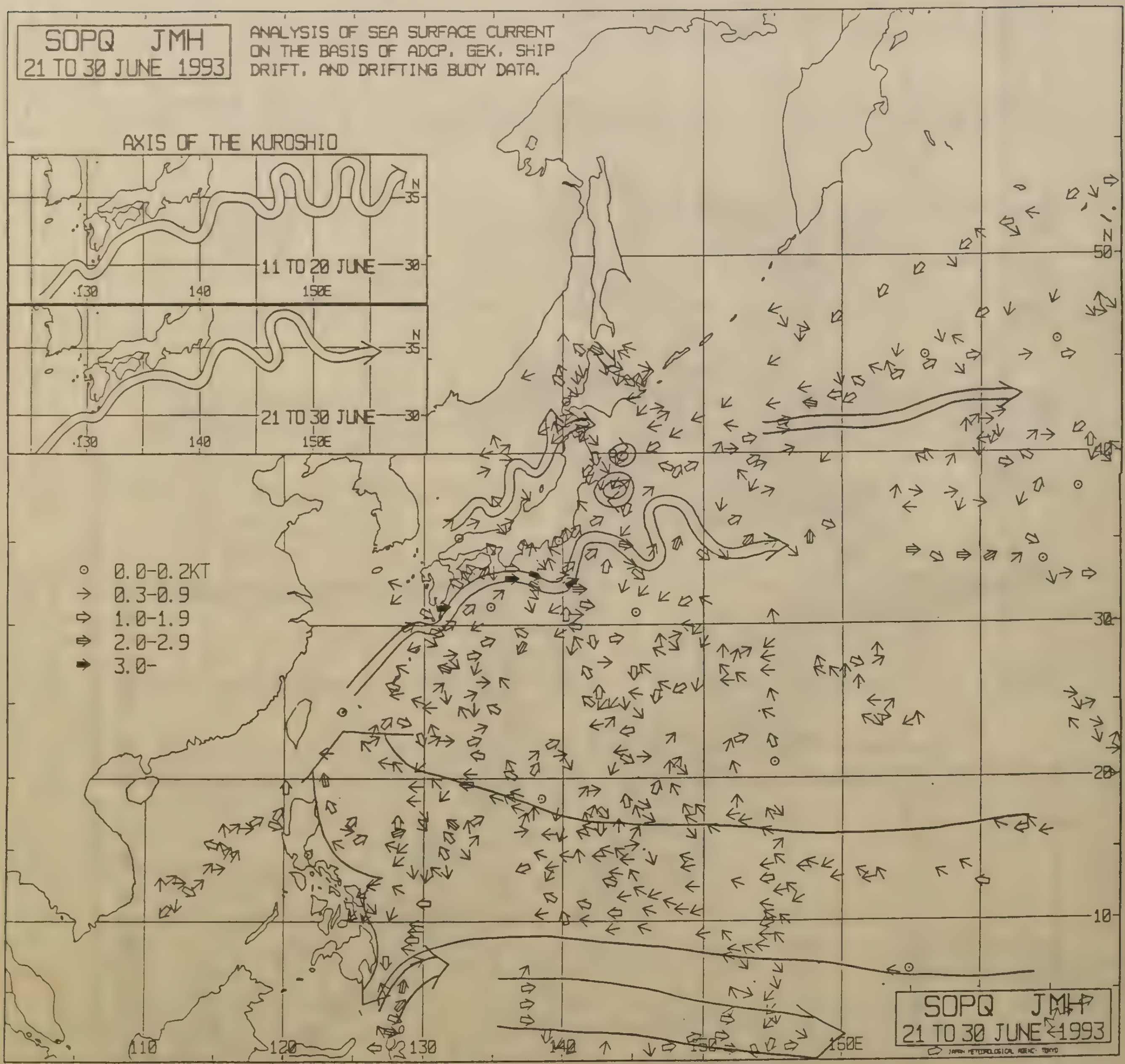
第18図　北西太平洋旬平均海面水温平年偏差時系列図

Fig.18 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas indicated at the bottom. Negative anomalies are shaded. Anomalies are computed with respect to the JMA climatology (1961−90).



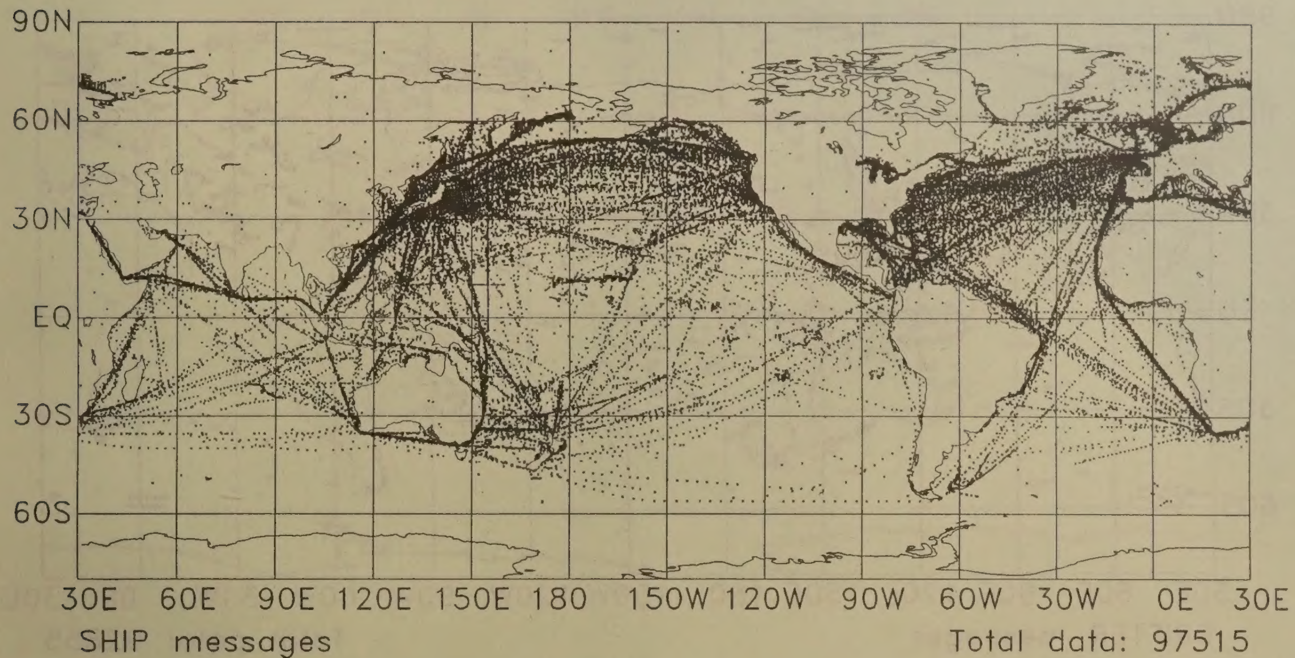
第19図　日本近海表層水温（深さ100M）図（1993年 6月）

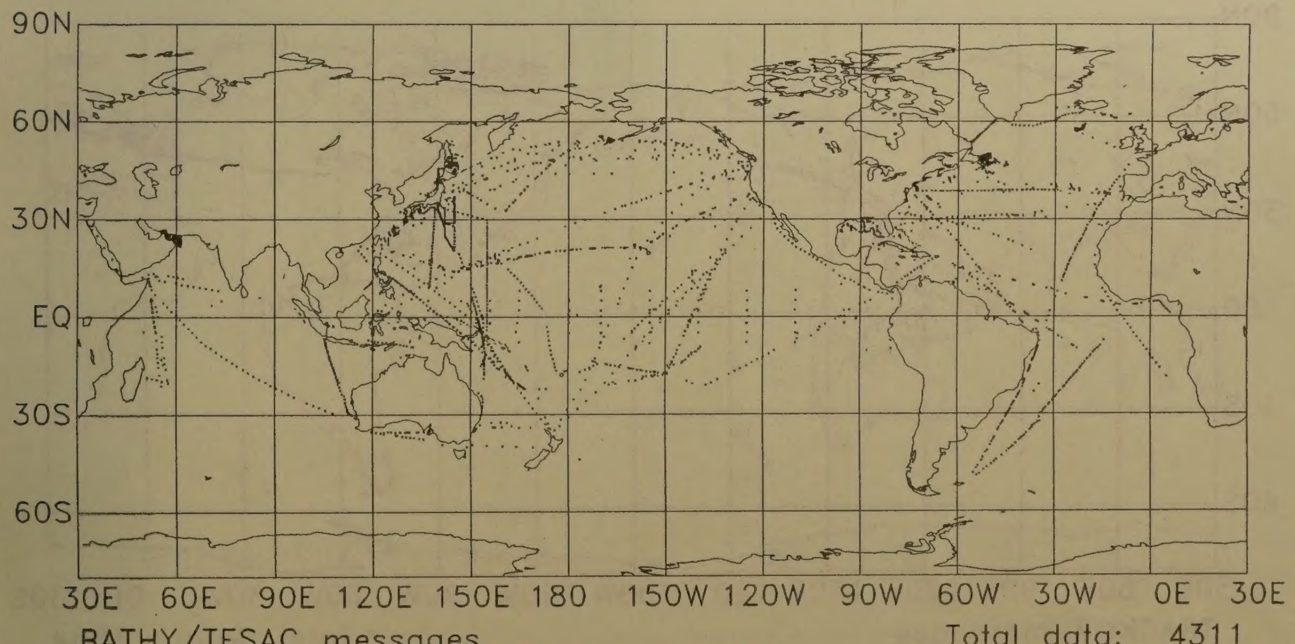
Fig.19 Subsurface (100m) temperatures in seas adjacent to Japan for JUN 1993.



第20図　北西太平洋旬平均海流図（1993年 6月下旬）

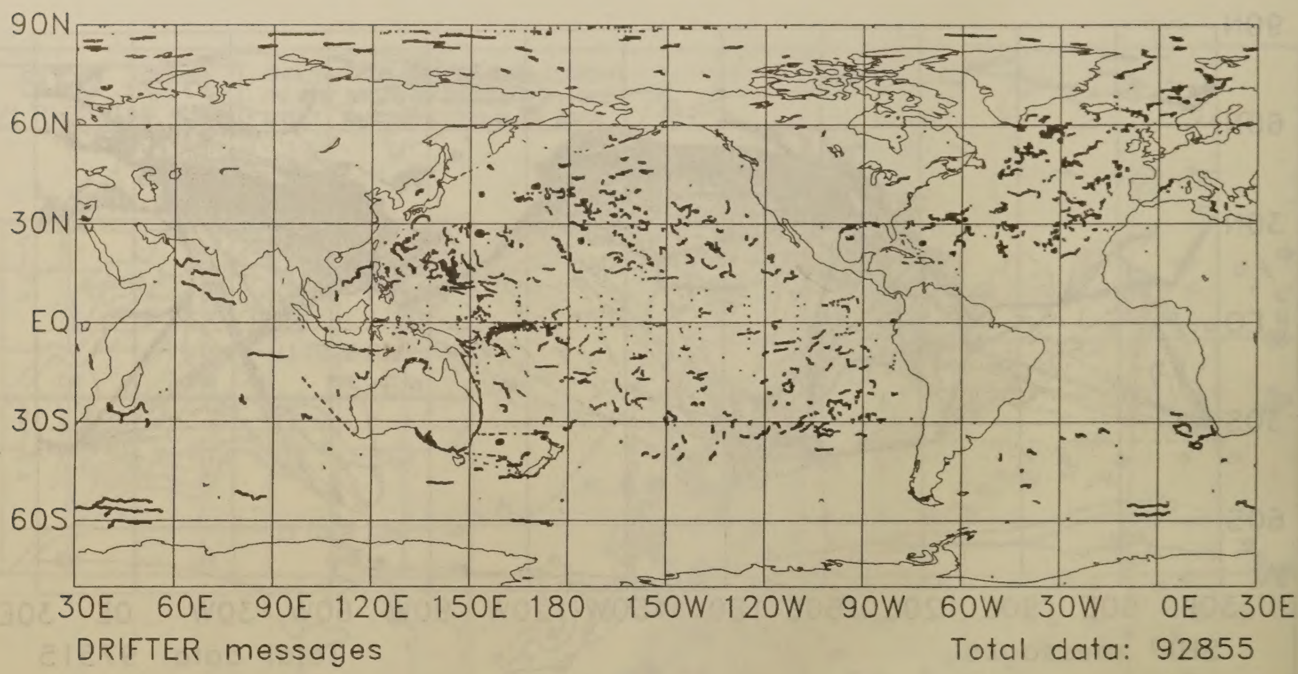
Fig.20 Ten-day analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in JUN 1993. Small arrows indicate sea surface currents measured with acoustic Doppler current profilers, GEKs deployed in research vessels, and ship drift by merchant ships/drifting buoys during the month. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

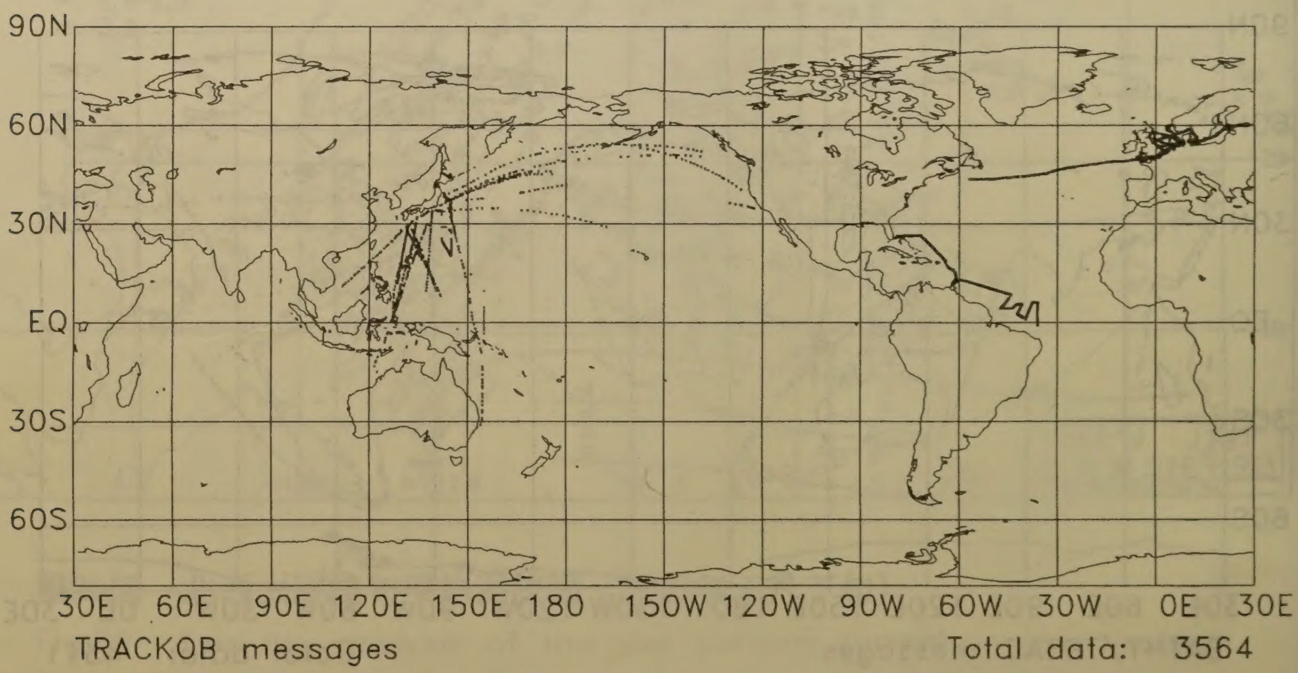




第21-1図　測点分布図(1993年 6月)

Fig.21−1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for JUN 1993.





第21-2図　測点分布図(1993年 6月)

Fig.21-2　Geographical distribution of DRIFTER messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for JUN 1993.

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